FRBSF Weekly Letter

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Services: A Future of Low Productivity Growth?

The question is so common lately, it has become trite: "Is America turning into a nation of hamburger flippers?" The cause for concern is a potentially disturbing pair of trends. First, employment in the United States increasingly has shifted away from manufacturing toward services. In 1963 manufacturing accounted for 30 percent of all jobs, but in 1991 that share had fallen to less than 17 percent.

Second, "real" productivity increases (that is, adjusted for inflation) have been significantly lower in services than in manufacturing. Between 1963 and 1986, real output per worker in manufacturing rose at an annual rate of 2.6 percent, while real output per worker in the services sector rose by only 0.2 percent. Taken together, these trends suggest dire consequences: a sector with negligible productivity gains is rapidly becoming the most important source of new jobs, while the more productive manufacturing sector is losing employment. The inference many observers draw is that America faces stagnation, with most of its labor force engaged in employment that exhibits little productivity growth, and hence, provides little increase in its standard of living.

This *Letter* takes a closer look at the data. After combining the results of other researchers with evidence from data on compensation, it appears that the fundamental data on which these dire predictions are made may be misleading. While the evidence is not conclusive one way or the other, data on compensation at least raise the possibility that the opposite is true: that labor productivity is growing faster in services than it is in manufacturing.

The source of the "real" evidence

Concern about lack of productivity growth in the service sector emerges from the data released by the U.S. Department of Commerce's Bureau of Economic Analysis (BEA) on nominal output, real output (that is, adjusted for inflation), and employment for each industry. Using these data, it is possible to compute "real" output per employee.

The difficulty facing BEA in determining changes in real output per worker is daunting. In many cases, outputs are not directly priced, and often it is difficult or impossible to measure the quantity of the output. This is particularly true in the service sector. For example, bank customers receive services from tellers and loan officers, but they do not pay directly for those services; instead they pay indirectly with interest rate spreads and fixed service charges. Similarly, service industries producing information (such as research) generate a product that is consumed by the public, but the product is often not priced and there is no way to count how many people benefit from that information.

Adding to the complexity is the problem of quality changes. With the exception of a few agricultural products, nearly all products change over time, with most embedding improved features. For example, a 1992 car cannot be compared directly with a 1972 car. We can count the number of cars sold and observe the prices charged, but counting the change in output—the stream of benefits derived from the car—will not be correct unless it is possible to standardize the car with earlier models, to distinguish and count improvements in dimensions of quality, safety, and emissions as well as the number of units produced.

BEA's methodology

Because of limitations on data collection, BEA must extrapolate from available information on prices and production to calculate price or quantity indexes for each industry. In the case of most manufacturing industries, BEA has information available about input costs, prices of some final products, and output indexes. Although the problem of quality remains, and not all final product prices are recorded, most manufacturing industries produce a physical output that is countable, which makes the process less abstract.

BEA faces the same conceptual problems in services that it does in manufacturing, but fewer data typically are available for services. Quantity

indexes usually are not available—in fact, there often is no physical "good" to count—and prices also are not observed directly. To derive "real output," therefore, BEA must extrapolate using indirect measures of input costs as proxies for price changes. In other industries, such as banking and recreation, measures of inputs are used—often the number of employees—to proxy for changes in the level of production.

While this approach is perhaps the only available strategy in some industries, the effects on productivity measurements are predictably biased. When real output is calculated for industries using labor quantities as an important measure of output, then *by definition* the industry will show no productivity growth. Moreover, price indexes based on input costs ignore potential quality improvements—such as higher skilled labor and better capital—and hence, may attribute quality improvements inaccurately to price increases rather than output increases.

Evidence from compensation data

Several researchers have looked at the validity of BEA's inter-industry productivity comparisons. Denison (1989) argues that BEA's approach could not accurately distribute output gains to industries when intermediate products (that is, products developed by one manufacturer and used by another for producing final consumer products) are involved. Moreover, Baily and Gordon (1988) used a case study analysis and questioned BEA's measurement of output gains attributed to each industry, suggesting a bias toward manufacturing. This bias also was noted by Smith (1972), who found that the data consistently pushed measured productivity gains toward the manufacturing sector and away from the service sector.

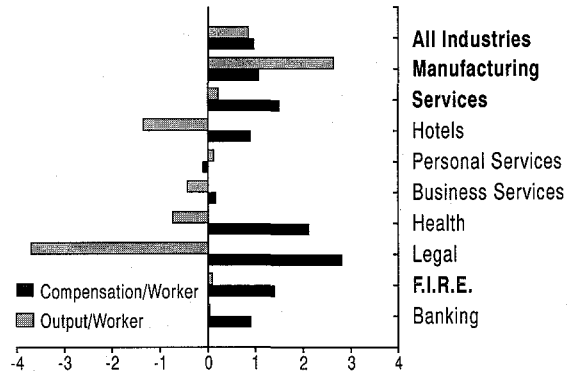
Unfortunately, these criticisms typically are qualitative rather than quantitative, making it difficult to reject BEA's conclusions. It is possible, however, to provide a quantitative check of the BEA data by using data on compensation growth by industry.

One of the central conclusions of economic theory is that wages are determined by the marginal value of labor's contribution to that output. Thus, changes in compensation should be related to changes in labor's marginal productivity. Research on inter-industry wage differentials offers some support to this proposition. Empirical research has found that a large portion of these wage differentials is related to observable labor quality factors—experience and education, for example—and other differentials are attributed to unobservable quality differences.

Compensation growth per worker in an industry, therefore, should be related to the growth in the productivity of its labor force. If workers are paid the value of their marginal product, the growth in compensation per worker in an industry reflects the growth in the average marginal product of that industry's labor force.

The accompanying chart compares real compensation growth per worker (the BEA's compensation series deflated by the consumer price index) to BEA's real output measure for manufacturing and several service-producing industries. In many cases, there are wide disparities in the relative growth rates for compensation and output.

Real Compensation and Output per Worker, Selected Industries
(Average Annual Percent Growth: 1963-86)



Consider the comparison between services and manufacturing. In contrast to the BEA real output data, compensation data indicate higher gains in services than in manufacturing. Service industry compensation per worker rose at a 1.5 percent annual rate, compared to 1.1 percent for manufacturing. In fact, manufacturing reported compensation gains just slightly above the average for all industries.

Other important differences are worth noting. Banking is found in the output data to have virtually no productivity growth, yet compensation growth matches the average for all industries. Moreover, output growth per worker in the health care and legal industries is reported to have been negative according to the real output series while recording higher increases in compensation growth than are found in any other industries.

Which measure is right?

Compensation is not a direct measure of productivity either, however. Economic theory shows that changes in compensation over time can be

split roughly into two parts: changes in the relative output price of the final good and changes in the marginal productivity of the labor used to make the good.

If output prices rise for a particular product, that may feed into compensation to workers in the form of raises and bonuses. Over time, though, the ability of labor to capture increases in output prices is determined by labor's ability to restrict the entry of new laborers. If higher wages are not the result of higher marginal productivity by the firm's labor force, those higher wages will attract new workers and bid down those wages unless the existing labor force can effectively restrict entry through unions or licensing restrictions.

The second source of compensation increases, linked to productivity gains, would appear where the firm has raised the quality of its labor force over time. Hiring larger proportions of skilled labor would raise the relative compensation growth of that industry.

Determining whether compensation increases are due to productivity gains or to output price gains, therefore, can be problematic. Nevertheless, one factor seems to be useful in distinguishing between the two effects: labor mobility. In some of the more heavily unionized and licensed industries (manufacturing, transportation, legal, and health care), compensation increases may be less useful as a measure of productivity gains. In other industries, however, where employment growth has been rapid, it is likely that compensation gains do reflect the market's evaluation of the relative productivity of those workers.

Moreover, in industries where capital/labor ratios have changed dramatically, compensation may provide a superior measurement of changes in labor productivity. BEA's simple measure of labor productivity growth—output per worker—is not adjusted for total productivity gains that are the result of increased productivity of non-labor inputs. Thus, in industries that have become more capital intensive, gains in average output per worker may reflect increasing productivity of other factors, not just labor. Compensation, which is a payment to labor for its contribution to total productivity gains, provides the market's assessment of the value produced by those workers.

For many industries, therefore, differences between the compensation growth rates and measured real productivity gains may signal measurement errors. Particularly in the case of service industries, where output and prices are nearly impossible to observe directly, compensation may offer an alternative measure of productivity gains. While it is clear that compensation growth is not a perfect measure of productivity growth, trends in compensation raise an important question: If productivity growth is so low in some sectors, why are employers willing to pay the workers so much? If market participants are relatively rational, the payment workers receive may be a better indicator of the market's evaluation of their productivity than is the traditional BEA measure.

Conclusions

Concern about the observed shift of employment toward service industries often is based on the assumption that services have lower productivity growth than manufacturing. The BEA real output data are used to support this proposition. As shown in this *Letter*, however, data on real compensation per worker provide conflicting evidence, at least suggesting the possibility that services have had faster productivity increases than manufacturing.

The compensation data are not a perfect measure of productivity growth either, but the fact that the data differ so dramatically from the output data is disturbing. At a minimum, the compensation data, along with results from other researchers looking at particular industries, suggest that the inter-industry productivity comparisons made with the "real" output data are biased and potentially misleading.

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